REMARKS

In response to the Office Action mailed February 3, 2005, Applicant respectfully requests reconsideration. Claims 1-16 were previously pending in this application. Claims 1, 9, and 16 have been amended. New claims 17 and 18 have been added. No claims have been canceled. As a result, claims 1-18 are pending for examination with claims 1, 9, and 17 being independent. The application is believed to be in condition for allowance.

Allowable Subject Matter

Applicant notes with appreciation the indication of allowable subject matter in claims 5-7 and 13-15.

Claim Objections

The Office Action objects to the second claim 14 (claim 16) for improper numbering. The second claim 14 has now been amended to claim 16. Accordingly, withdrawal of the objection is respectfully requested.

Rejections Under 35 U.S.C. §103

The Office Action rejects claims 1-3, 8-11, and 16 under 35 U.S.C. §103(a) as purportedly being unpatentable over the Applicant Admitted Prior Art (AAPA) in view of Pellegrini, U.S. Patent No. 5,163,179 (Pellegrini) and further in view of Tullis, U.S. Patent No. 6,563,101 (Tullis). The Office Action also rejects claims 4 and 12 under 35 U.S.C. §103(a) as purportedly being unpatentable over the AAPA in view of Pellegrini, in view of Tullis and further in view of Toyofuku, U.S. Patent No. 6,392,279 (Toyofuku). Applicant respectfully traverses these rejections.

The Office Action asserts that the AAPA teaches a monolithic photodetector including a first active area of doped single-crystal silicon corresponding to first and second photodiodes having a same surface area as two charge transfer MOS transistors, and as one storage diode, a cathode of each photodiode being connected to a cathode of the storage diode via one of the charge transfer MOS transistors, a second active area of doped single-crystal silicon arranged

next to a portion of the first active area associated with the second photodiode and corresponding to a precharge switch having a first terminal connected to the cathode of the storage diode and a second terminal connected to a reference voltage, and a third active doped single-crystal silicon area arranged next to the portion of the first active area associated with the first photodiode and corresponding to two read MOS transistors in series, the gate of one of the read transistors being connected to the cathode of the storage diode and the drain or the source of one of the read transistors being connected to a processing system. The Office Action concedes that the AAPA fails to show the surfaces of the second and third active areas exposed. However, the Office Action asserts Pellegrini teaches the active area of the photodetecting device is opened (exposed). The Office Action concludes that it would have been obvious to one having ordinary skill in the art, at the time the invention was made, to incorporate the teaching of Pellegrini into the device taught by the AAPA in order to release the electrons from the photodiodes. The Office Action concedes that the combination of the AAPA and Pellegrini fails to teach that the second and third active areas are identical. However, the Office Action asserts Tullis teaches identical active areas. The Office Action further concludes that it would have been obvious to one having ordinary skill in the art, at the time the invention was made, to incorporate the teaching of Tullis into the device taught by the AAPA and Pellegrini in order to get the same gain of electrons in the active areas. Applicant respectfully disagrees.

Discussion of Cited References:

The AAPA describes a pixel photodetector of an image sensor. Figure 3 (relied upon by the Office Action) depicts a topology of a 2.5T pixel. Gate GM4 of MOS transistor M4 corresponds to a portion of a polysilicon strip 14 and gate GM5 of MOS transistor M5 corresponds to a portion of a polysilicon strip 16. A photodiode D3 is formed in the portion of active area 10 above gate GM5 and a photodiode D2 is formed in the portion of active area 10 under GM4. The device described by the AAPA also includes polysilicon strips 14, 16, 22, 24 and 26, as well as active areas 18 and 20. Photon absorption at the level of the portions exposed to light of active areas 18, 20 and of polysilicon strips 22, 24, and 26 may cause a release of electrons in photodiodes D2 and D3. Electrons originating from active area 20 and from polysilicon strips 24 and 16, tend to mainly diffuse towards photodiode D2, while electrons originating from active area 18 and from polysilicon strip 22 tend to mainly diffuse towards

photodiode D3. Since the exposed surfaces of active areas 18 and 20 are different, and the exposed surfaces of polysilicon strips 22, 24, and 26 are also different, an uneven electron diffusion towards photodiodes D2 and D3 occur for the same light exposure. The uneven electron diffusion translates to fixed noise in an electron processing system. The AAPA describes solutions to the uneven diffusion problem by using amplification gains and/or masking techniques (page 4, line 15 – page 5, line 6).

Pellegrini describes Platinum Silicide (PtSi) layers formed on silicon substrates (abstract). Pellegrini describes a fabrication step in which an active area of a photodetecting device is opened with use of a wet chemical etch (Col. 4, lines 52-53). A PtSi layer is later formed on the active area which increases the emission of electrons (Col. 5, lines 35-56).

Tullis describes an image tracking device that includes an array of light-sensitive elements (abstract). Tullis teaches geometrical distortions inherent in optical systems may be overcome by using non-rectilinear geometry (Col. 3, lines 1-3). Tullis describes a single active area 11 per cell frame 9, arranged in an array (figure 1b). A fill-factor is defined as a ratio of the active area of a light-sensitive element disposed in a cell frame to the frame area of that cell frame (Col. 7, lines 10-12). In any given cell frame, the active area in that cell frame may or may not be identical in shape or in area to the active areas in adjacent cell frames (Col. 8, lines 33-37). Tullis does not teach or suggest active areas of equal surface areas within the *same* cell frame or pixel.

The Combination of the AAPA, Pellegrini, and Tullis is Improper:

As discussed above, Tullis does not teach nor suggest active areas of equal surface areas within the *same* cell frame or pixel. Tullis instead teaches adjacent cell frames which may or may not be identical in size (Col. 8, lines 33-37). Therefore one of ordinary skill in the art would not have been motivated to incorporate the teachings of Tullis with the combined teachings of the AAPA and Pellegrini since the teaching relied upon by the Office Action is not found in Tullis.

The Claims Patentably Distinguish over the Combination of the AAPA, Pellegrini, and Tullis:

Even if the AAPA, Pellegrini, and Tullis were combined in the manner alleged by the Office Action (which Applicant does not concede), the claims still patentably distinguish over any such combination.

Claims 1-8:

Amended claim 1 is directed towards a monolithic photodetector comprising a pixel of a pixel matrix. The pixel further comprising a first active area of doped single-crystal silicon including first and second photodiodes having a same surface area, as two charge transfer MOS transistors, and as one storage diode, a cathode of each photodiode being connected to a cathode of the storage diode via one of the charge transfer MOS transistors, a second active area of doped single-crystal silicon arranged next to a portion of the first active area associated with the second photodiode and including a precharge switch having a first terminal connected to the cathode of the storage diode and a second terminal connected to a reference voltage, and a third active doped single-crystal silicon area arranged next to the portion of the first active area associated with the first photodiode and including two read MOS transistors in series, the gate of one of the read transistors being connected to the cathode of the storage diode and the drain or the source of one of the read transistors being connected to a processing system, wherein the surfaces of the second and third active areas exposed to a lighting are substantially identical.

As discussed above, the combination of the AAPA, Pellegrini, and Tullis does not teach or suggest a pixel of a pixel matrix, said pixel further comprising a second and third area of doped single-crystal silicon, wherein the surfaces of the second and third active areas exposed to a lighting are substantially identical, as recited in claim 1.

Claims 2-8 depend from claim 1 and patentably distinguish over any combination of the AAPA, Pellegrini, Tullis, and Toyofuku for at least the same reasons.

Claims 9-16:

Amended claim 9 is directed towards a monolithic photodetector comprising a pixel of a pixel matrix. The pixel further comprising a first active area of doped single-crystal silicon including first and second photodiodes having a same surface area as two charge transfer MOS transistors, and as one storage diode, a second active area of doped single-crystal silicon arranged next to a

portion of the first active area associated with the second photodiode and including a precharge switch, and a third active doped single crystal silicon area arranged next to the portion of the first active area associated with the first photodiode and including two read MOS transistors in series, wherein the surfaces of the second and third active areas exposed to light are substantially identical.

As should be appreciated from the above discussion relating to claim 1, the combination of the AAPA, Pellegrini, and Tullis does not teach or suggest a pixel of a pixel matrix, said pixel further comprising a second and third area of doped single-crystal silicon, wherein the surfaces of the second and third active areas exposed to light are substantially identical, as recited in claim 9.

Claims 10-16 depend from claim 9 and patentably distinguish over any combination of the AAPA, Pellegrini, Tullis, and Toyofuku for at least the same reasons.

Claims 17 and 18:

Claim 17 is directed towards a monolithic photodetector comprising a pixel of a pixel matrix. The pixel further comprising a first active area of doped single-crystal silicon including first and second photodiodes having a same surface area as two charge transfer MOS transistors, and as one storage diode, a second active area of doped single-crystal silicon arranged next to a portion of the first active area associated with the second photodiode and including a precharge switch, and a third active doped single crystal silicon area arranged next to the portion of the first active area associated with the first photodiode and including two read MOS transistors in series, wherein the second and third active areas exposed to light comprise substantially equal surface areas.

As should be appreciated from the above discussion relating to claim 1, the combination of the AAPA, Pellegrini, and Tullis does not teach nor suggest a pixel or a pixel matrix, said pixel further comprising a second and third area of doped single-crystal silicon, wherein the second and third active areas exposed to a light comprise substantially equal surface, as recited in claim 17.

Claim 18 depends from claim 17 and patentably distinguishes over any combination of the AAPA, Pellegrini, Tullis, and Toyofuku for at least the same reasons.

CONCLUSION

A Notice of Allowance is respectfully requested. The Examiner is requested to call the undersigned at the telephone number listed below if this communication does not place the case in condition for allowance.

If this response is not considered timely filed and if a request for an extension of time is otherwise absent, Applicant hereby requests any necessary extension of time. If there is a fee occasioned by this response, including an extension fee, that is not covered by an enclosed check, please charge any deficiency to Deposit Account No. 23/2825.

Respectfully submitted,
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